

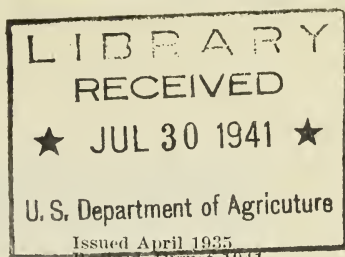
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United States Department of Agriculture

U. S. AGRICULTURAL MARKETING SERVICE

SERVICE AND REGULATORY ANNOUNCEMENTS NO. 147¹

AIR-OVEN AND WATER-OVEN METHODS SPECIFIED IN THE OFFICIAL GRAIN STANDARDS OF THE UNITED STATES FOR DETERMINING THE MOISTURE CONTENT OF GRAIN²

The use of airtight containers to protect the sample of grain from losing or gaining moisture before the moisture test is made, and the careful handling of the grain or its ground product are necessary if the moisture test results are to be authentic. Samples of grain that are to be tested for moisture content should not be unduly exposed to the air before grinding (if grinding is required); and it is even more important that any ground material must be properly protected to prevent any change in moisture content.

AIR-OVEN METHOD

APPARATUS

Metal dishes.—Metal dishes should have a diameter of about 55 mm., a height of about 15 mm., and should be provided with inverted slip-in covers fitting tightly on the inside which can be easily removed and replaced while the dishes are in the oven.

Airtight desiccator.—Desiccator should contain reignited quicklime, anhydrous calcium chloride, or other suitable desiccant.

Oven.—Oven should be of triple-walled type (DeKhotinsky or equal), capable of being maintained at 130° C. ($\pm 1^\circ$), provided with an opening for ventilation, and equipped with a suitable thermometer accurate to within 0.5° C.

DETERMINATION A (one-stage procedure)³

Grind a representative 10- to 15-gram portion of the original sample (Wiley Laboratory Mill, Intermediate Model, or equal) so that all the ground material will pass through a 20-mesh wire sieve. Great care should be taken to avoid loss or gain of moisture in the sample before grinding, during the grinding, and before weighing. Certain types of mills heat the grain during grinding, and such mills should not be used unless the mill is permitted to cool between grindings. The meal should pass directly from the mill to a suitable container not much larger than necessary to hold the sample. The container should be tightly closed immediately after the sample is introduced.

Immediately after grinding, place representative portions (duplicates at least) of approximately 2 to 3 grams each of the ground, well-mixed sample into metal covered-type dishes which have been previously dried at 130° C., cooled in a desiccator, and individually weighed soon after they reached room temperature. Immediately cover the dishes containing the portions of the sample and weigh each in grams to the fourth decimal place. For each portion subtract the weight of the dish from the total weight and record the result

¹ This announcement was originally issued as Service and Regulatory Announcements No. 147 of the Bureau of Agricultural Economics.

² See the OFFICIAL GRAIN STANDARDS OF THE UNITED STATES for proper method to use with each kind of grain.

³ This procedure may be used on all samples believed to contain 13 percent or less of moisture. If, after oven trials, the sample shows more than 13 percent moisture the two-stage procedure described under Determination B must be followed.

as the weight of the damp material. Uncover the dishes and place them in the oven regulated to a temperature of 130° C. ($\pm 1^\circ$). All moisture dishes should be placed as near as possible to the center of a single wire shelf in the oven, and the oven thermometer should be placed so that its mercury bulb comes as close as possible to the dishes.

After heating the material for 1 hour (timing the interval from that instant when the oven reach 130° C. *after* the insertion of the metal dishes), cover the metal dishes while still in the oven, transfer them to a desiccator, and weigh them individually soon after they reach room temperature. In each case calculate the loss in weight as moisture and determine the percentage of moisture by dividing the loss in weight due to heating by the weight of the original portion of sample that was used for the test. Replicate determinations should check within 0.1 percent moisture.

DETERMINATION B (two-stage procedure)

Use covered metal dishes (duplicates at least) which have been previously dried at 130° C., cooled in a desiccator, and individually weighed soon after they reached room temperature. Fill the dishes nearly full with representative portions of the unground grain, the moisture content of which is to be determined. Weigh each covered dish including its content and determine the weight in grams to the fourth decimal place. In each case subtract the weight of the dish from the total weight and record the result as the weight of the material used.

Uncover the dishes and place them in a warm, well-ventilated place (preferably on top of the heated oven) protected from dust so that the grain will dry reasonably fast and reach approximately an air-dry condition. This usually may be accomplished in from 14 to 16 hours when the top of the heated oven is used for this preliminary drying. In all cases the moisture content must be reduced to 13 percent or less in this first stage.

Close the metal dishes containing the air-dried grain and weigh each of them soon after they reach room temperature. In each case, determine the loss in weight of the grain and record it as the moisture loss that is due to air drying. Using the air-dried grain, proceed in the manner described under Determination A, making at least duplicate determinations on each air-dried portion.

Calculate the percentage of moisture in the original sample according to the method indicated in the following example:

Item:

1. Weight of the portion of the original sample of grain used for the test.....	27.2358 gm.
2. Weight of the portion after air drying.....	25.1836 gm.
3. Moisture loss due to air drying.....	2.0522 gm.
4. Weight of the subportion of the air-dried sample used for the 130° C. air-oven drying.....	2.8753 gm.
5. Weight of the subportion after oven drying.....	2.5779 gm.
6. Loss of moisture due to oven drying.....	.2974 gm.
7. Weight of moisture in the original air-dried portion (see item 2).....	$0.2974 \times 25.1836 = 2.6048$ gm.
8. Total weight of moisture in the original portion (see item 1)	
(a) Loss in air drying.....	2.0522
(b) Moisture in air-dried portion.....	2.6048
	4.6570 gm.
9. Percentage of moisture in original portion (see item 1)	
[total weight of moisture in original portion (item 8)	
divided by the weight of the original portion (item 1)]	$\frac{4.6570}{27.2358}$] 17.10 percent

Replicate determinations should check within 0.1 percent moisture.

WATER-OVEN METHOD

APPARATUS

Metal dishes.—Metal dishes should be the same as those described under apparatus for the air-oven method.

Airtight desiccator.—Desiccator should be the same as that described under apparatus for air-oven method.

Oven.—Oven should be of the water-jacketed type so heated that the temperature in the center of the oven when the water is boiling is 99° to 100° C. at an atmospheric pressure of 760 mm. The oven should be equipped with a suitable thermometer accurate to within 0.5° C.

DETERMINATION

Use covered metal dishes (duplicates at least) which have been previously dried at 100° C., cooled in a desiccator, and individually weighed soon after they reached room temperature. Fill the dishes nearly full with representative portions of the unground grain the moisture content of which is to be determined. Weigh each of the covered dishes, including its content and determine its weight in grams to the fourth decimal place. Subtract the weight of the dish from the total weight and record the result as the weight of the material used.

Uncover the dishes and place them in the water oven heated to the temperature of boiling water (99°–100° C.) for 96 hours. At the end of this heating period cover the metal dishes while still in the oven, transfer them to a desiccator, and weigh them individually soon after they reach room temperature. In each case calculate the loss in weight as moisture and determine the percentage of moisture by dividing the loss in weight due to heating by the weight of the original portion of the sample that was used for the test. Replicate determinations should check within 0.1 percent moisture.

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